New finds of *Orchis simia* Lam. and *Orchis* × *beyrichii* A.Kern. (Orchidaceae) at eastern Medvednica (near Zagreb, Croatia)

short communication

Vesna Zadravec (A. Stipančića 12, 10000 Zagreb; vesna@zadweb.biz.hr)
Mladen Zadravec (Hrvatsko herpetološko društvo - Hyla, I. Lipovac 7, 10000 Zagreb; mladen.z123@gmail.com)
Mario Zadravec (A. Stipančića 12, 10000 Zagreb; mario@zadweb.biz.hr)

Sažetak

Tijekom 2015. uočene su dvije nove svojte unutar područja Natura 2000 „Vejalnica i Krč“ (JI padine planine Medvednica, SI od glavnog grada Hrvatske, Zagreba). To su: *Orchis simia* Lam. i *Orchis* × *beyrichii* (Rchb.f.) A.Kern. Ovo je prvi recentni nalaz vrste *O. simia* na području istočne Medvednice te prvi nalaz hibridne svojte *O.* × *beyrichii* za kontinentalnu Hrvatsku. Sistematizira se opažene morfološke varijacije i razlikovne značajke između roditeljskih vrsta i hibrida te diskutira u odnosu na rezultate drugih istraživanja o hibridnim zonama.

Ključne riječi: orhideje, hibrid, Vejalnica i Krč, Hrvatska, Natura 2000 ekološka mreža

Abstract

In 2015 two new orchid taxa were observed for the first time inside the Natura 2000 site „Vejalnica and Krč“ (SE slopes of the Medvednica Mt., NE of the Croatian capital Zagreb). These are: *Orchis simia* Lam. and *Orchis* × *beyrichii* (Rchb.f.) A.Kern. This is the first recent find of *O. simia* at eastern Medvednica and the first find of *O.* × *beyrichii* for continental Croatia. Observed morphological variations and differences between the parent species and the hybrid are systematised and discussed with respect to other published hybrid zone research results.

Keywords: orchids, hybrid, Vejalnica and Krč, Croatia, Natura 2000 Ecological Network

Introduction

In Croatian flora there are 148 different wild orchid taxa recorded so far: 121 species, 27 subspecies and 12 hybrids (Nikolić 2015). They grow mostly on anthropogenic and semi-natural habitats and are susceptible to any human-generated disturbance and dereliction. For conservation reasons, in 2013 several Croatian orchid-rich sites were included, as important orchid habitats, in the Natura 2000 European Ecological Network. Among those is the site “Vejalnica and Krč”, situated on the hilly terrain of the SE slopes of the Medvednica Mt. (Fig. 1).

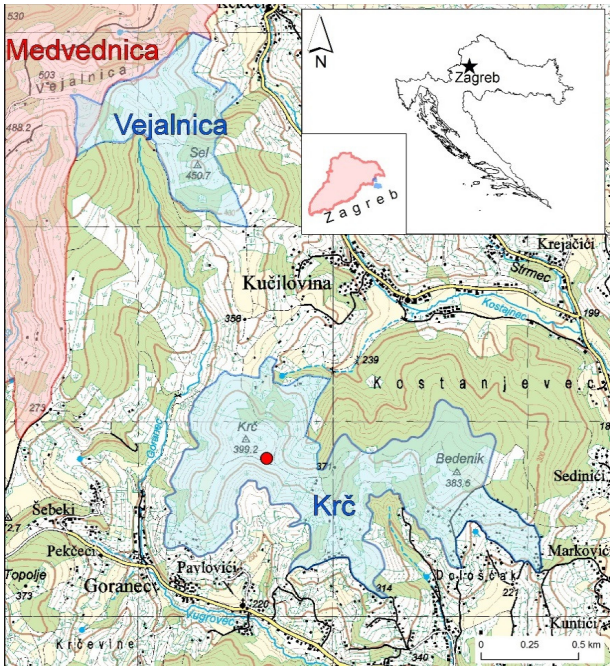

Figure 1. The Natura 2000 site “Vejalnica and Krč” and its location within Croatia. Red dot – the location where the research was carried out.

Inside the “Vejalnica and Krč” site orchids have been continuously surveyed from 2011. In 2013 a detailed inventory revealed the presence of 24 orchid taxa (Zadravec et al. 2014), out of which 14 are listed in The Red Book of Vascular Flora of Croatia (Nikolić & Topić 2005).

Material and methods

The new taxa were observed in the period 27 April-1 May 2015 during our regular springtime survey. We visited the site three times to observe and to document the flowers opening. The exact location was geocoded by a Garmin eTrex 30 GPS device and all flowering phases were photographed. Orchids were identified using Delforge (2006). We entered the new finds into the Flora Croatica Database (Nikolić 2015).

Results and discussion

We have found two orchid taxa, i.e. *Orchis simia* Lam. and *Orchis* × *beyrichii* (Rchb.f.) A.Kern. They occur on a single location on the Krč hill: X: 467903, Y: 5084804 (HTRS96 coordinate system). There were 15 plants in two groups in a 10 m^2 area. Nearly 1/3 of those plants were *O. simia* (Fig. 2/a) and about 2/3 were the hybrid *O.* × *beyrichii* (Fig. 2/b,c).

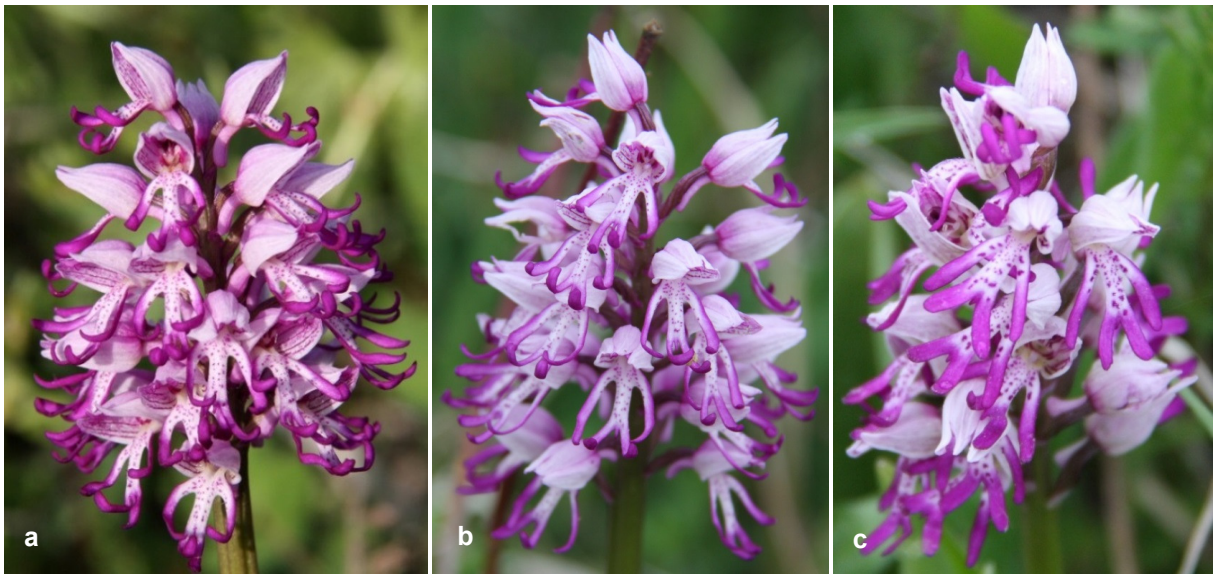

Figure 2. a/ *Orchis simia* from the Krč hill., b-c/ *Orchis* × *beyrichii* from the Krč hill.

The parent species of the *O.* × *beyrichii* hybrid are *Orchis militaris* L. and *O. simia*. *O. militaris* is widespread and abundant over the whole Krč hill and also around the location where the new hybrid has been found. *O. simia* is a rare species in continental Croatia and this is a unique find on this hill so far. A comparison of all three taxa inflorescences shows their similarities and differences (Fig. 3).

Figure 3. a/ *Orchis militaris* (left), b/ *O.* × *beyrichii* (center), c/ *O. simia* (right).

A distinction between the hybrid and its parent species is based upon four morphological characteristics of lobes and two flowering aspects observed on our research site, as summerised in Table 1.

Table 1. Comparison summary for *Orchis militaris*, *O.* × *beyrichii* and *O. simia*.

Distinction aspect	*O. militaris*	*O.* × *beyrichii*	*O. simia*
Lobe length	short	elongated	elongated
Lobe width	wide	narrow	narrow
Lobe colour	from light to dark pink	from mid to dark pink	mostly dark pink
Lobe tips curvature	not curved	not curved to slightly curved	curved
Flowers opening order	from the bottom upwards	no particular order	from top to bottom
Flowering timing	starts flowering after *O. simia* and *O.* × *beyrichii*	starts flowering after *O. simia* and before *O. militaris*	starts flowering before *O. militaris* and *O.* × *beyrichii*

Our morphological observations concur with the initial hybrid taxon description and drawings published by Kerner (1865). The parent species flowers opening order is documented by Delforge (2006) and stated in Table 1. We have documented that *O.* × *beyrichii* plants open flowers in no particular order. Some lower and some upper flowers open simultaneously (Fig. 4).

Figure 4. *Orchis* × *beyrichii* flowers with disordered opening.

The elongated lobes are sufficient to tell apart *O.* × *beyrichii* from *O. militaris*, but the distinction between *O. simia* and *O.* × *beyrichii* is not so clear. Presumably, when the lobes are less curved it is *O.* × *beyrichii* but that is uncertain without conducting a genetic analysis. The majority of *O.* × *beyrichii* are more similar to the *O. simia* parent rather than *O. militaris* and are all found close to *O. simia* plants. The proximity suggests that both taxa could prefer the similar set of mycorrhizal fungi. The hybrid's morphological similarity to spatially associated parent is already observed by other researchers for *O.* × *hybrida* (Lindl.) Boenn. ex Rchb., a hybrid between *O. militaris* and *O. purpurea* Huds. (Jacquemyn et al. 2012a).

The morphological variety of *O.* × *beyrichii* hybrid plants may be a result of introgression caused by backcrossing with parents or just a natural variety inside the first generation. Cozzolino et al. (2006) researched a hybrid zone of closely related parent species of the *Orchis* genus and concluded that the backcrossing is rare or absent and that vast majority of hybrids belong to the first generation. Such an outcome is explained by the reduced fertility of the hybrids (Jacquemyn et al. 2012b).

Our *O. simia* find is the first for eastern Medvednica, 63 years after the only known record on the peak Pečovje located 5 km W from Krč (Urlić-Ivanović 1952). We have checked that location this season but were unable to confirm the presence of *O. simia*. The habitat on the location is in late stages of succession and the population may have been lost. On the southern slopes of Medvednica *O. simia* was recorded 86 years ago in the part of the Zagreb City called Rebro that recently became urbanized (Horvat 1929). The nearest and the only recent observation of *O. simia* at Medvednica

was from 2012, on the SW slopes, some 20 km SW from Krč (Zadravec et al. 2013). In the rest of the continental Croatia *O. simia* occurs scarcely on Kalnik, Papuk, Krndija, Žumberak and Samobor hills, but is more abundant in the Istria at N Adriatic and on the S Adriatic islands. In the rest of the world *O. simia* occurs from NW Europe to W Asia and N Africa (Govaerts et al. 2015).

In Croatia there is one literature reference of a 26-year-old find of *O.* × *beyrichii* hybrid by Perko M. in Istria, near the town Pazin (Griebl 2009). Our find is the first for continental Croatia and until now the hybrid was not listed in the Flora Croatica Database (Nikolić 2015). In the rest of the world *O.* × *beyrichii* occurs from N Europe to W Asia (Govaerts et al. 2015).

Conclusion

O. simia occurs in small numbers on a single known location on the Krč hill and is spatially associated with *O.* × *beyrichii* hybrid. So, *O. simia* is at risk due to habitat changes and introgression by hybrid-parent backcrossing. It is important to search for more *O. simia* locations on the Krč hill in the future. *O. militaris* is fairly abundant on the whole Krč hill and is assumed to be a stable population, not threatened by introgression.

Krč hill can be recommended for future research of *Orchis* hybrids because it contains a hybrid zone between three closely related species of the *Orchis* genus: *O. militaris, O. purpurea,* and *O.simia.* Besides the previously found *O.* × *hybrida* and newly found *O.* × *beyrichii*, there is a possibility of a third hybrid combination to be found in the future: *Orchis* × *angusticruris* Franch., a hybrid between *O. purpurea* and *O. simia*.

Acknowledgements

We thank Ljiljana Borovečki-Voska for the confirmation of our identifications and Toni Nikolić for the swift addition of the new taxon into the Flora Croatica Database.

Literature

- **Cozzolino, S., Nardella, A.M., Impagliazzo, S., Widmer, A., Lexer, C. (2006):** Hybridization and conservation of Mediterranean orchids: Should we protect the orchid hybrids or the orchid hybrid zones? Biological Conservation 129(1):14-23.
- **Delforge, P. (2006):** Orchids of Europe, North Africa and the Middle East. A&C Black Publishers, London.
- **Govaerts, R., Bernet, P., Kratochvil, K., Gerlach, G., Carr, G., Alrich, P., Pridgeon, A.M., Pfahl, J., Campacci, M.A., Holland Baptista, D., Tigges, H., Shaw, J., Cribb, P., George, A., Kreuz, K., Wood, J. (2015)**: World Checklist of Orchidaceae. Facilitated by the Royal Botanic Gardens, Kew. http://apps.kew.org/wcsp/ (accessed November 10, 2015).
- **Griebel N. (2009):** Die Orchideen Istriens und deren Begleitflora. http://norbert-griebl.jimdo.com/berichte/ (accessed September 10, 2015).
- **Horvat, I. (1929):** Rasprostranjenje i prošlost mediteranskih, ilirskih i pontskih elemenata u flori sjeverne Hrvatske i Slavonije. Izvješća Botaničkog zavoda Sveučilišta u Zagrebu 4: 1-34.
- **Jacquemyn, H., Brys, R., Honnay, O., Roldán-Ruiz, I., Lievens, B., Wiegand, T. (2012a)**: Nonrandom spatial structuring of orchids in a hybrid zone of three *Orchis* species. New Phytologist 193: 454-464.
- **Jacquemyn, H., Brys, R., Honnay, O., Roldàn-Ruiz, I. (2012b):** Asymmetric gene introgression in two closely related Orchis species: evidence from morphometric and genetic analyses. BMC Evolutionary Biology 12(1): 178.
- **Kerner, A. (1865):** Die hybriden Orchideen der österreichischen Flora. Verhandlungen der Zoologisch-Botanischen Gesellschaft 15: 203-236.
- **Nikolić, T., Topić, J. (eds.) (2005):** The Red Book of Vascular Flora of Croatia: Ministry of Culture, State Institute for Nature Protection, Zagreb..
- **Nikolić, T. (ed.) (2015):** Flora Croatica Database. University of Zagreb, Faculty of Science, Department of Botany and Botanical Garden, Zagreb. http://hirc.botanic.hr/fcd (accessed November 2015).

- **Urlić-Ivanović, S. (1952):** Prilog poznavanju flore i vegetacije istočnog dijela Medvednice. Faculty of Science, University of Zagreb.
- **Zadravec, M., Borovečki-Voska, Lj., Šincek, D. (2013):** Ponovni nalaz vrste *Orchis simia* Lam. i hibridne svojte *Orchis* × *hybrida* Boenn. ex Rchb. (Orchidaceae) na Medvednici. Glasnik Hrvatskog botaničkog društva 1(2): 17-18.
- **Zadravec, V., Zadravec, Ml., Zadravec, Ma. (2014):** Orchids of Vejalnica and Krč (Medvednica). Glasnik Hrvatskog botaničkog društva 2(1): 4-12.